IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Seiji BANDO et al.

Appln. No. 10/579,734 Group Art Unit: 1617

Filed: May 18, 2006 Examiner: Pihonak Sarah

For: PROCESS FOR PRODUCING 2-ACYLTHIOPHENE COMPOUND

DECLARATION UNDER 37 C.F.R.SECTION 1.132

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir or Madam:

I, Seiji BANDO, hereby declare:

1) That I am one of the inventors of the instant invention, and

2) That the experiments given below were carried out under my general direction and supervision.

Purpose of Experiment

To carry out a reaction at a temperature higher than the reaction temperature range specified in US Appl. No. 10/579,734 and also higher than the reaction temperature specified in US Appl. No. 10/579,734 in the production of a 2-acyl thiophene compound so as to compare the content of the resulting 3-isomer byproduct.

Experiment 1

2.5 g of a sulfonic acid polymer (a product of SIGMA-ALDRICH, trade name: DOWEX-DR2030), which is a cation exchange resin, and 25.5 g (0.25 mol) of acetic anhydride were introduced into a 100 ml 4-necked flask equipped with a stirrer, condenser,

thermometer, and dropping funnel. 21.0 g (0.25 mol) of thiophene was added dropwise at 20°C to 25°C over 1 hour. After the dropwise addition, the reaction was allowed to proceed at 30°C for 65 hours. After the reaction, the sulfonic acid polymer was separated by filtration to obtain a dark brown filtrate. The filtrate was subjected to distillation to remove unreacted thiophene, acetic anhydride, and acetic acid byproduct, thus yielding 25.9 g (0.205 mol) of 2-acetylthiophene. The yield of 2-acetylthiophene was 82% based on thiophene. The 3-isomer, i.e., 3-acetylthiophene content was determined by high-performance liquid chromatography. The 3-acetylthiophene content of the resulting 2-acetylthiophene was 0.3 wt%. The following measurement conditions were used to perform the high-performance liquid chromatography: column: TSKgel ODS-80TS 4.6 mm ϕ x 250 mm (a product of Tosoh Corporation), mobile phase: 0.05 wt% aqueous potassium dihydrogen phosphate solution (phosphoric acid pH = 3.7)/acetonitrile = 75/25 (V/V), flow rate: 1 ml/min, column thermostat temperature: 30°C, and detector: UV 220 nm.

Experiment 2

2-acetylthiophene was produced using the same method as in Experiment 1 except that the reaction temperature after the dropwise addition of thiophene was set to 60°C and the reaction time was set to 25 hours. The resulting 2-acetylthiophene was 25.9 g (0.205 mol). The yield of 2-acetylthiophene was 82% based on thiophene. Additionally, the 3-isomer content was determined using the same manner as in Experiment 1. The 3-acetylthiophene content of the resulting 2-acetylthiophene was 0.5 wt%.

Comparative Experiment 1

2-acetylthiophene was produced using the same method as in Experiment 1 except that the reaction temperature after the dropwise addition of thiophene was set to 100°C and the reaction time was set to 10 hours. The resulting 2-acetylthiophene was 21.2 g (0.168 mol). The yield of 2-acetylthiophene was 80% based on thiophene. Additionally, the 3-isomer content was determined using the same manner as in Expriment 1. The 3-acetylthiophene content of the resulting 2-acetylthiophene was 0.9 wt%.

Table 1 shows the reaction temperature after dropwise addition, the reaction time, the yield of the resulting 2-acetylthiophene, and the 3-acetylthiophene content using the methods described above. Note that, for reference, Table 1 also shows the reaction temperature, the reaction time, the yield of the resulting 2-acetylthiophene, and the 3-acetylthiophene content in Example 3 described in US Application No. 10/579,734.

Table 1

	Reaction Temperature (°C)	Reaction Time (hr)	Yield (%)	Content of 3-acethylthiofen
Experiment 1	30	65	82	0.3
Example 3 (US Appl. No. 10/579,734)	40	45	84	0.4
Experiment 2	60	25	82	0.5
Comparative Experiment 1	100	10	80	0.9

Considering the Results of the Experiments

Table 1 shows that when a reaction was carried out at temperatures of 30°C, 40°C and 60°C, the 3-acetylthiophene content of the resulting 2-acetylthiophene was 0.3 wt%, 0.4 wt%, and 0.5 wt%, respectively; i.e., the 3-thiophene isomer content was very low. However, when the reaction temperature was as high as 100°C, the 3-acetylthiophene content of the resulting 2-acetylthiophene was 0.9 wt%; i.e., the 3-isomer content as a byproduct was very high.

3. I, the undersigned, declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or

imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 3 September 2009 Seiji Bando

Seiji BANDO